

Claims

1. An implantable heart rhythm management device comprising:
 - one or more leads for sensing electrical signals of a patient or for applying electrical energy to the patient;
 - a monitoring circuit for monitoring heart activity of the patient through one or more of the leads; and
 - a therapy circuit for delivering electrical energy through one or more of the leads to a heart of the patient, wherein the therapy circuit includes one or more aluminum electrolytic capacitors, each comprising:
 - one or more terminals;
 - a header having a header thickness and one or more recesses, with each recess having a depth less than the header thickness;
 - one or more aluminum fasteners, with each fastener fastening one of the terminals to the header and having a head at least partially within one of the recesses; and
 - an active element including one or more aluminum foils, with at least one of the foils electrically coupled to one of the aluminum fasteners.
2. The implantable heart rhythm management device of claim 1, wherein the header comprises first and second bonded layers, with the second bonded layer having a second thickness and with each recess having a depth less than the second thickness.
3. The implantable heart rhythm management device of claim 1, wherein the header comprises first and second bonded layers, with the first layer consisting essentially of rubber and the second layer consisting essentially of phenolic resin.

4. The implantable heart rhythm management device of claim 1, wherein the device is a defibrillator; one or more of the aluminum fasteners is a rivet; the active element includes one or more tabs coupled to one or more of the aluminum foils; and the rivet is ultrasonically welded to at least one of the tabs.

5. A capacitor comprising:
a tubular housing having a longitudinal axis and having an opening defining a plane intersecting the longitudinal axis;
a header filling or covering at least a portion of the opening, having a maximum thickness in a dimension parallel to the longitudinal axis, and having one or more recesses, each with a depth, measured in the dimension parallel to the longitudinal axis, which is less than the maximum thickness of the header; and
one or more terminals fastened to the header with one or more fasteners, each fastener having a head at least partly within one of the recesses.

6. The capacitor of claim 5 wherein the housing and terminals consist essentially of aluminum.

7. A capacitor comprising:
a tubular housing having a longitudinal axis and having a closed end and an open end, each defining a plane intersecting the longitudinal axis;
a header filling or covering at least a portion of the opening, having a maximum thickness in a dimension parallel to the longitudinal axis of the housing, and having one or more recesses, each with a depth, measured in the dimension parallel to the longitudinal axis, which is less than the maximum thickness of the header;

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an active element within the tubular housing between the closed end and the header, the active element including one or more conductive members; and
one or more terminals fastened to the header with one or more conductive fasteners, each fastener having a head electrically coupled to one or more of the conductive members and at least partly within one of the recesses.

8. A capacitor comprising:
capacitor casing means;
header means attached to the capacitor casing means and having one or more recesses; and
terminating means fastened to the header with one or more fasteners, each fastener having a head at least partly within one of the one or more recesses.
9. The capacitor of claim 8 wherein the header comprises first and second layers, with the second layer contacting an end of the fastener opposite the head.
10. The capacitor of claim 9 wherein the second layer consists of a material different from the material of the first layer.
11. The capacitor of claim 9 wherein the first and second layers have respective first and second thickness which comprise the maximum thickness of the header and wherein the depth of each recess is less than the first thickness.

12. A method of making a capacitor, comprising:
providing an active element including one or more foils and at least one electrically conductive tab coupled to one or more of the foils;
providing a fastener including at least a shank with a head on one end; and
ultrasonically welding the head of the fastener to the one electrically conductive tab.
13. The method of claim 12, wherein providing the active element occurs before providing the fastener.
14. The method of claim 12 further comprising:
providing a header having an upper and a lower surface, the lower surface having at least one recess and at least one hole in the recess; and
inserting the shank of the fastener through the one hole in the recess until the head is positioned in the recess.
15. The method of claim 14, wherein inserting the shank of the fastener through the one hole occurs after ultrasonically welding the head to the one electrically conductive tab.

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